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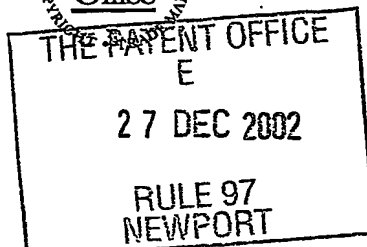
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# Request for grant of a patent

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1. Your reference

IAM/LM/P/22007.GB

2. Patent application number

(The Patent Office will fill in this part)

27 DEC 2002

0230211.5

3. Full name, address and postcode of the or of each applicant (underline all surnames)

Voith Fabrics Heidenheim GmbH & Co KG  
Kurzestraße 11  
Heidenheim, D89522  
Germany

Patents ADP number (if you know it)

If the applicant is a corporate body, give the country/state of its incorporation

A German Company

07841125002

4. Title of the invention

Improvements in Dryer Fabrics

5. Name of your agent, (if you have one)

"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)

WILSON GUNN M'CAW  
41-51 ROYAL EXCHANGE  
CROSS STREET  
MANCHESTER  
M2 7BD

Patents ADP number (if you know it)

7153927001 ✓

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (if you know it) the or each application number

Country

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Date of filing  
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7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application

Date of filing  
(day / month / year)

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (Answer 'Yes' if

Yes

- a) any applicant named in part 3 is not an inventor, or
  - b) there is an inventor who is not named as an applicant, or
  - c) any named applicant is a corporate body.
- See note (d))

**Patents Form 1/77**

9. Enter the number of sheets for any of the following items you are filing with this form. Do not count copies of the same document

Continuation sheets of this form

Description 7

Claim(s)

Abstract

Drawing(s) 2 x 2

10. If you are also filing any of the following, state how many against each item.

Priority documents

Translations of priority documents

Statement of inventorship and right to grant of a patent (Patents Form 7/77)

Request for preliminary examination and search (Patents Form 9/77)

Request for substantive examination (Patents Form 10/77)

Any other documents (please specify)

11. I/We request the grant of a patent on the basis of this application.

Wilson Gunn M'Caw

Signature *Wilson Gunn M'Caw* Date 24/12/02

12. Name and daytime telephone number of person to contact in the United Kingdom Mr Ian Middlemist 0161 827 9400

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### Improvements in Dryer Fabrics

This invention relates to improvements in dryer fabrics of the kind set out in our co-pending British Patent Application No. 0224749.2.

In the said application we described dewatering fabrics for use in dynamic  
5 condensation drying apparatus which comprise a three layer fabric, typically having a paper contacting surface layer, a core having a high void volume and a machine side surface layer. The paper contacting surface layer is preferably the finest of the three layers, that is, it is comprised of closely spaced yarns or fibres of small diameter or of composite or non-woven material of small void space. The machine side surface  
10 layer is preferably of intermediate fineness, being composed of yarns or fibres or composite material of a larger diameter and more loosely spaced than those of the paper contacting surface layer. The high void volume of the core may be provided for example by wide spacing of the constituent yarns or fibres, with the yarns most probably being of relatively large diameter, or by incorporation of a perforated sheet  
15 or membrane.

The improvement of this invention resides in the realisation that the dryer or dewatering fabric may be comprised of zones of differing mean void volume, preferably also of differing void size or yarn diameter, rather than distinct layers; and also that the machine side surface zone of intermediate fineness, whilst highly  
20 desirable, can in some circumstances be omitted so that the machine side of the high void volume core may rest directly on the cold cylinder of the condensation drying apparatus.

A two zone structure may for example comprise a two-ply woven core zone of relatively coarse cross-machine direction or weft yarns, and superposed

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thereon, on the paper side of the fabric, a two ply woven zone of relatively fine cross-machine direction or weft yarns. The layers are interwoven by means of warp which interlink all the weft yarn plies into a single woven structure. To achieve a three zone structure, this woven structure may be modified by incorporation of a further ply of finer weft yarns, on the cylinder side of the core zone 'below' the yarns of the core zone and these may be bound into the weave structure by weft yarns which pass about the further yarns and the lower ply of the core yarns. The core zone may also be reduced to a single ply of larger diameter yarns, and any of the zones can be made of any desired number of plies.

10        Examples of possible alternative multizone structures include a two layer fabric comprising a relatively fine woven layer laminated to the paper side of a perforated membrane of synthetic plastics material, or resin impregnated fibrous material. The interstices of the membrane are preferably tapered, for example frusto-conical, with their wider ends adjacent the fine woven layer, and their narrower ends opening from the surface of the membrane at the cooling cylinder side. The tapering perforations comprise two notional zones of different void volume, the wide ends forming a core zone of greater void volume and the narrower ends a cylinder side zone of lower void volume, despite the fact that there is no precise demarcation between the zones. Alternatively, the perforations may be stepped, giving a quasi-  
15 three layer fabric.  
20

Another possible embodiment of the fabric comprises a structure of sintered particles, bonded together by fusion at their tangents, after having been subjected to heating sufficient to soften their outer layers to the point of tackiness, and to pressure sufficient to ensure area rather than point contact between the particles,

but low enough to leave significant void space in interstices between the particles. The sintered particle structure is preferably made as a single unit and comprising a core zone of relatively large particles with large spaces remaining between them, and an outer zone on the paper side with relatively fine particles defining a paper  
5 contacting surface, and also preferably a further zone on the cylinder side of relatively fine particles (possibly coarser than those on the paper side) which define a cylinder contacting surface these zones created by laying down particles of differing sizes as the structure is built up.

The sintered particle structure may, or may not, incorporate reinforcing fibres.

10 Some embodiments of dewatering fabrics according to the invention will be described by way of example with reference to the accompanying drawings, wherein:-

Fig. 1 is a diagram showing the weave structure of a first fabric according to the invention, with the paths of only selected warp yarns shown for clarity;

Fig. 2 is a similar diagram showing the weave structure of a second fabric  
15 according to the invention, again with only paths of selected warp yarns shown for clarity;

Fig. 3 is a cross-sectional view of a composite fabric in accordance with the invention; and

Fig. 4 is a cross-sectional view of a further embodiment of fabric according to  
20 the invention comprising a structure of sintered polymeric particles.

Fig. 1 illustrates the weave structure of a de-watering fabric 10 according to the invention intended for use in condensation drying apparatus. The fabric comprises a multi-ply structure comprising four plies or strata of cross-machine direction extending weft yarns, each ply being connected to the neighbouring plies by

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the interweaving of the warp yarns which are disposed in three systems. The fabric is woven as a unitary structure which cannot be broken into separate layers.

The weft yarns comprise on the upper face of the fabric two plies 11, 12 of relatively fine yarns on the intended paper-contacting side of the fabric, and two plies  
5 13, 14 of yarns of much greater thickness which form the core of the fabric.

The two groups of weft yarns of different thickness give the fabric 10 two distant zones a and b. Zone a comprises fine yarns 11, 12 and zone b comprises thicker yarns 13,14 with greater void space and pore size between them. The fabric 10 is a unitary woven structure by means of the interweaving of weft yarns with three  
10 systems of the warp yarns 15, 16, 17.

Yarns 15 of the upper warp system interweave with the finer yarns 11 and 12 of the zone a; yarns 16 of the middle warp system interweave with the lower finer yarns 12 and the upper thicker yarns 13 and the yarns 17 of the lower warp system interweave with the thicker yarns 13 and 14 of the zone b.

15 The interweavings can be in accordance with any standard weave pattern which achieves a strong interconnection between the warp and weft yarns. The upper surface of zone a may include long floats of all or some of the warp yarns of system 15 to maximise the smooth contact surface for carrying the paper web.

In Fig. 2, a second embodiment of a fabric 20 according to the invention is  
20 illustrated by a diagram showing its weave structure. This fabric 20 comprises four plies of weft yarns, and three interconnecting warp yarn systems interweaving adjacent plies of the weft yarns into a single unified structure.

An upper, paper contacting surface is provided by small diameter closely spaced weft yarns in plies 21, 22 which form an upper fine zone a, whilst a relatively

coarse ply of large diameter more widely spaced yarns 23 forms a core zone b with relatively large void space. Below the larger yarns 23 are disposed a further ply of finer yarns 24 forming a second finer zone c, the finer yarns 24 being interspaced with the larger yarns 23.

5        The finer yarns 24 are interwoven with the thicker yarns 23 by yarns 27 of a lower warp yarn system, and the thicker yarns 23 are also interlaced in turn with the lower ply of finer yarns 22 by yarns 26 of a middle warp yarn system. The yarns 22 are in their turn interwoven with the top ply of fine yarns 21 by the yarns 25 of an upper warp yarn system. These upper yarns 25 may be floated over two or more weft  
10    yarns on the upper paper web contacting surface of the fabric 20 to provide for maximum support and contact surface.

Fig. 3 is a sectional view of a composite fabric 30 in accordance with the invention. The fabric 30 comprises an upper paper contacting layer, formed by a fine woven material 31 such as sail cloth, which is bonded by adhesive or thermal bonding  
15    for example to a composite membrane 32. The composite membrane 32 is of a suitable plastics material, or a resin bonded non woven material, or reinforcing fibres encapsulated in a resin matrix. The membrane 32 is perforated with tapering apertures 33 which may be frusto conical (with circular end openings) or pyramidal (with square or rectangular end openings). The wider ends 34 of the apertures 33 are  
20    at the upper face of the membrane 32 where it abuts the woven material 31, whilst the narrower ends 35 of the apertures 33 are at the lower face of the membrane 32. Whilst the material 31, which defines a fine pored upper zone a also has a discrete and separate layer. The membrane 32, by reason of the taper of the apertures 33 provides an upper core zone b with high void space and a lower zone c of reduced void space.

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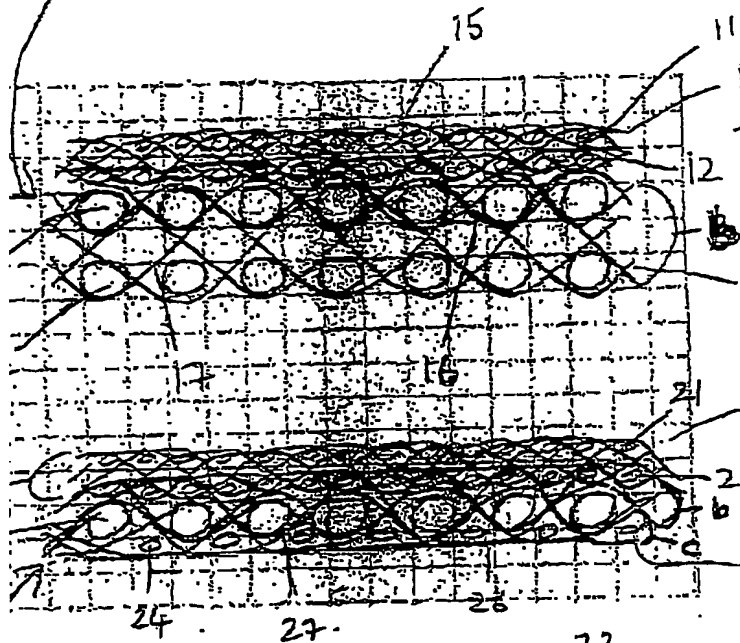
The is no well defined boundary between the zones, and the boundary may be taken to be along a line such as X - X in Fig. 3 where for example the void cross-section falls below 50% of that at the upper face of the membrane.

Fig. 4 illustrates a further embodiment of the fabric according to the invention wherein the fabric 40 is comprised of a layer of polymeric particles which have been thermally bonded at their contacting surfaces by the action of a degree of pressure to produce sufficient contact area, but not to impair porosity, and heating to above the softening point of the polymer; in other words the particles have been sintered to form a sheet. The particles comprise a core zone b of relatively large particles 41, which provide for relatively large void spaces therebetween. An upper zone a on the paper contacting side of fabric 40 is made up of relatively small particles 42, and a lower zone on the cooling side of the fabric of particles 43 which are smaller than the large particles 41, but may nevertheless be larger than particles 42. The layer of polymeric particles comprises a single sintered or thermally bonded structure which falls into three zones of different particle size and porosity. The structure may include reinforcing fibres which may be included in the thermal bonding, serving by their length to link a plurality of particles. The larger particles 42 may be finely divided polymer sheet or fibrous material, whilst the finer particles such as 41 or 43 may be microspheres or microbeads of the kind used in syntactic plastic compositions.

In the above embodiments, the upper fine zone, whether provided by finer yarns or particles, provides a smooth surface for paper contact. The core zone b in each case has relatively high void space and allows drainage of moisture away from the paper. The cooling belt side finer zone c may as in the case of Fig. 1 be absent, or as in Fig. 3 be indistinctly demarcated from the core zone b.

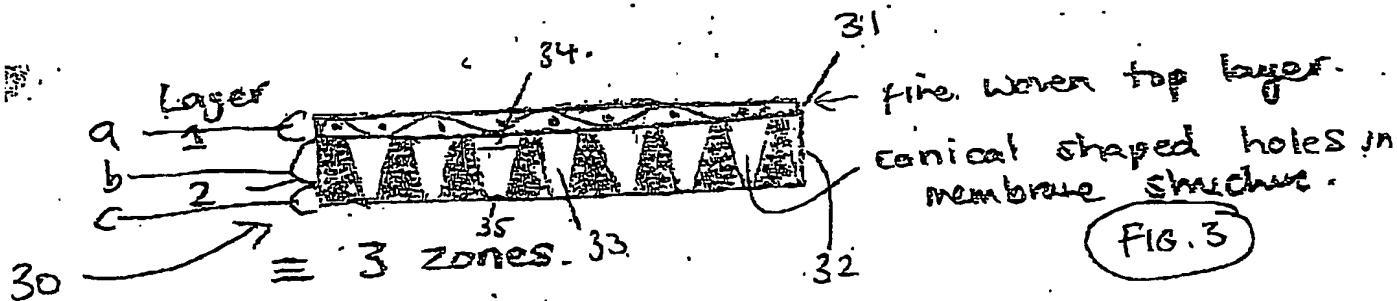
The Fig. 4 embodiment may be modified by providing a gradient of particle size inwardly from the surfaces of the fabric towards the core zone b. This would help to eliminate migration of fine particles from the outer zones a or c into the voids of zone b thus avoiding obstruction of the voids, and the sintered structure could just  
5 comprise two of the zones, for example (a) comprising the finer particles 41 and (b) comprising the coarser particles 42.

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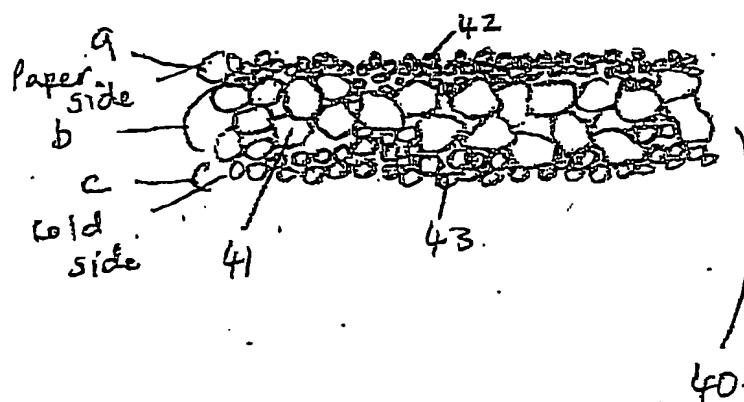


Two zone structure - wavy as one layer - **FIG 1**

Three zone wavy structure - wavy in one step - **FIG 2**



**FIG. 3**



Sintered structure - not 3 distinct layers, but 3 zones.

**FIG. 4**

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Fig. 1

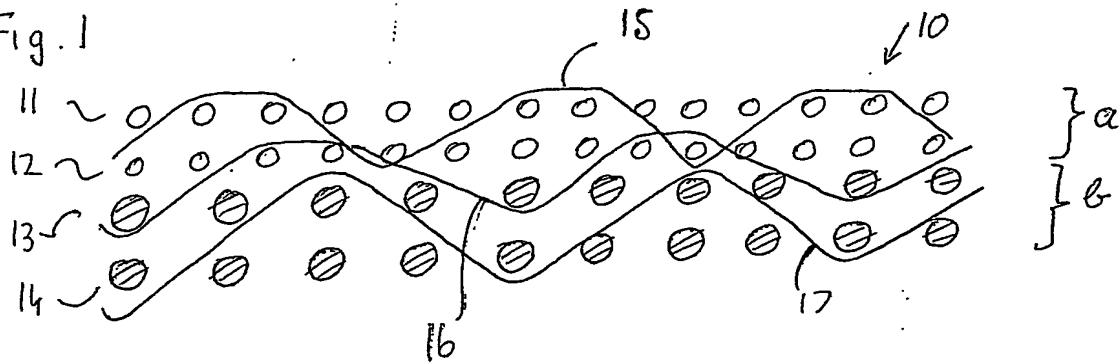


Fig. 2

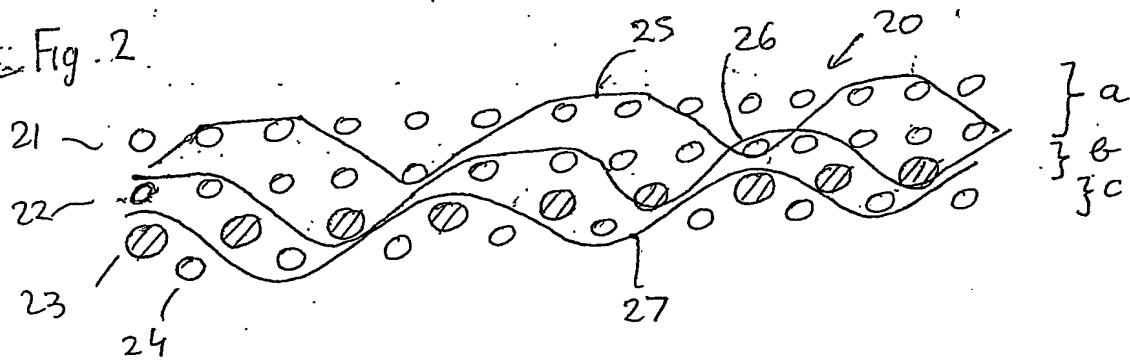


Fig. 3

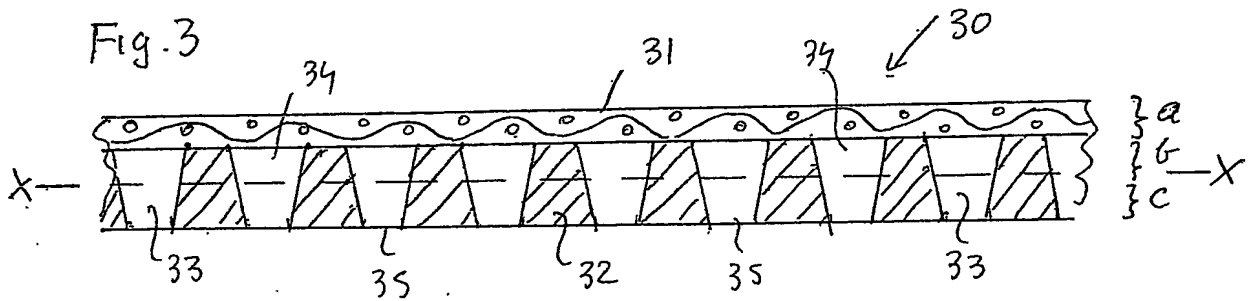
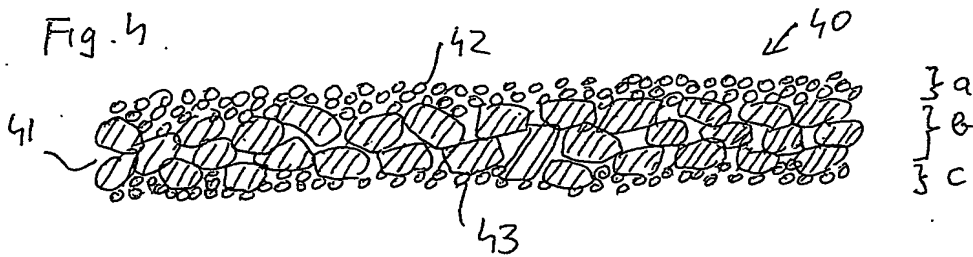


Fig. 4



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